Exploring Heat Flow Distribution in the Westernmost Mediterranean Sea: Insights from the Albacore Cruise

Sylvie Leroy*[1], Frederique Rolandone[1], Jeffrey Poort[1], Elia D'acremont[1], Sara Lafuerza[1], Léa Vidil[1], and Team Albacore Cruise[2,3,4]

[1]Institut des Sciences de la Terre de Paris – Institut National des Sciences de l'Univers : UMR7193, Sorbonne Universite, Centre National de la Recherche Scientifique : UMR7193, Institut National des Sciences de l'Univers, Centre National de la Recherche Scientifique – France

[2]Géoazur – Institut National des Sciences de l'Univers, Observatoire de la Cote d'Azur, COMUE Université Côte d'Azur (2015-2019), Université Côte d'Azur, Centre National de la Recherche Scientifique, Institut de Recherche pour le Développement – France

[3]Linneaus University – Suède

[4]Facultatif de Ciencies de la Terra Universitat de Barcelona, Catalonia – Espagne

Résumé

During the ALBACORE cruise (R/V Pourquoi Pas?) in 2021, a total of 14 new measurements of heat flow were gathered in the Alboran Sea, which is the westernmost region of the Mediterranean Sea. The collection of these measurements involved the use of autonomous thermal probes fixed to sediment corers with a length of 6 meters to determine temperature gradients. Onboard, a needle probe instrument was utilized to measure the thermal conductivity of the sediment cores that were recovered.

In a previous study, a significant contrast in heat flow was observed between the western and eastern parts of the Alboran Basin, with values of 69 ± 6 mWm-2 and 124 ± 8 mWm-2, respectively. Our focus in this study is primarily on the Bokkoya and Al Idrissi active strike-slip fault zones, which mainly extend in a north-south direction between these two domains. To assess the heat flow characteristics, three profiles were conducted perpendicular to the fault zones. These profiles exhibited notable discrepancies in heat flow values both along and between them.

The northern profile displayed a consistent heat flow with an average value of 65 mWm-2. The middle profile demonstrated heterogeneous heat flow patterns, with an average of 83 mWm-2 and variations of ± 10 mWm-2 over distances of hundreds of meters. Conversely, the southern profile indicated high and variable heat flow values ranging from 155 to 205 mWm-2 across similar distances. These local irregularities in thermal activity could potentially be linked to hydrothermal processes. The transportation of heat through hydrothermal circulation has been previously observed in active faults, and in the Alboran Sea basin, the active fault zone segment may serve as a conduit for such circulation.

Mots-Clés: Heat Flow, Alboran, fluids, active faults

*Intervenant